This document includes Section 10.0 – WPB 110 Class: Vessels with Compression Ignition Engines, Landing craft, Coastal Mine Hunters, and Buoy Tenders, of the Draft EPA Report “Surface Vessel Bilgewater/Oil Water Separator Characterization Analysis Report” published in August 2003. The reference number is: EPA-842-D-06-017

DRAFT
Characterization Analysis Report Surface Vessel Bilgewater/Oil Water Separator

Section 10.0 – WPB 110 Class: Vessels with Compression Ignition Engines, Landing craft, Coastal Mine Hunters, and Buoy Tenders

August 2003

SECTION 10.0 – WPB 110 CLASS

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10.0 WPB 110 CLASS

The U.S. Coast Guard Island Class (WPB 110) is the representative vessel class selected for the group of small vessels that rely on CI engines for main propulsion. This chapter presents the physical parameters, chemical data, field data, descriptive information, and generation rates for the WPB 110 Class vessels.

This group consists of various vessel classes including landing craft, coastal mine hunters, patrol ships, torpedo trial craft, harbor tugs, and buoy tenders. These ships have up to four main propulsion CI engines. While smaller ships have auxiliary machinery, the size and the amount of the equipment are substantially less than in ships over 400 tons. These vessels routinely operate within 12 nm from shore and on inland waters. Some of the larger vessels in this group are designed as oceangoing vessels.

The Coast Guard Island Class (WPB 110) was chosen as the representative vessel class for this group because it is one of the newest and largest vessel classes (49 hulls), and is distributed along the Pacific, Atlantic, and Gulf coasts. The class length of 110 feet and 117 tons of displacement is close to the group average length of 98 feet and displacement of 132 tons (weighted by the number of hulls). This vessel group includes various new vessels under construction such as the Coast Guard 87-foot Marine Protector class, of which the last hull is scheduled for delivery by FY 2003.

The primary bilge oil water separator (OWS) system currently installed onboard WPB 110 Class vessels is a 2-gpm gravity coalescence type oil-water separator. These vessels typically process bilgewater both pierside and underway, discharging the processed effluent into the surrounding waters. Subsequent characterization analyses are based on a 2-gpm system processing the entire volume of bilgewater. WPB 110 Class vessels use one of two 120-gpm oily waste transfer pumps to offload oily waste and one 8-gpm waste oil transfer pump to offload waste oil to shore facilities.

The following summarizes the general vessel characteristics for the WPB 110 Class vessels.

<u>General Vessel Characteristics (USCG, 2002)</u>:

Max Draft (ft):	7
Max Length (ft):	110
Max Beam (ft):	21
Displacement (tons):	117

10.1 BASELINE DISCHARGE

The baseline discharge is defined as the direct discharge of the bilgewater collected in the oily waste holding tank (OWHT). This discharge is assumed to occur at the normal OWS flow rate while bypassing the OWS. It is important to note that, although the term baseline discharge is used for this report, Armed Forces vessels do not discharge bilgewater from the OWHT directly overboard without treatment. This scenario is included in the Uniform National Discharge

Standards (UNDS) analysis only to establish a reference point for subsequent comparisons. The baseline analysis will be based on discharging the entire volume of untreated bilgewater overboard at 2 gpm through the OWS system discharge port.

10.1.1 Characterization Data

Sources of bilgewater aboard the WPB 110 Class vessels include liquid that drains from the interior spaces and upper decks into the bilge or lowest inner part of the vessel's hull (Navy, 2001a). Sources of bilgewater can be found in the main engine rooms, auxiliary machinery rooms, steering gear room, pump room, air conditioning and refrigeration machinery room. The liquid phase of this fluid may be contaminated with oily constituents comprised from DFM, 2190TEP lube oil (auxiliary equipment), lube oil, synthetic lube oil, hydraulic oil (crane and steering gear), and various grades of grease lubricants used on pulleys, cables, valves, and other components which may have dripped directly into bilge spaces, or other ship spaces communicating with the bilge. Additional potential bilge constituents include dissolved metals and metal-containing particulate matter.

10.1.1.1 Physical Parameters

The physical parameters presented in this section include values necessary for hydrodynamic modeling of the discharge, which differs from shipboard data. The characteristics of the WPB 110 baseline discharge (Table 10-1) were developed using the assumption that bilgewater is discharged overboard at the OWS design flow rate(s) while bypassing the OWS.

Table 10-1. Discharge Characteristics for WPB 110 Baseline

Modeling Parameters	Values
Option Group	Baseline
Vertical (feet)	+1
Transverse (feet)	+10
Length (feet)	74
Diameter (inches)	0.5
Temperature (°C)	25
Salinity (ppt)	8.0
Flow (gpm)	2
Velocity (ft/sec)	3.3
Duration of Release Event (hr)	0.90
Time Between Release Events (hr)	648

Vertical – Approximate distance from waterline to discharge port (+, above, -, below)
Transverse – Distance from centerline to discharge port (+, port, -, starboard)
Length – Approximate distance from forward perpendicular to discharge port
Diameter – Diameter of discharge port
ppt – parts per thousand
gpm – gallons per minute
ft/sec – feet per second
hr – hour
°C – degrees Celsius

The influent of the OWS is characterized in this report as the baseline from which a relative analysis of the marine pollution control device (MPCD) options can be performed. The parameters for the engineering and modeling recommendation summary are based on the specifications in WPB 110 installation drawings of the OWS and a ship check.

Several parameters were identified for the discharge port on the WPB 110. These parameters include: discharge port location in relation to the waterline (vertical), distance from the centerline to discharge port (transverse), approximate distance from forward perpendicular to discharge port (length), and discharge port diameter (diameter) (USCG, 1989). Additional discharge characteristics identified for modeling purposes include temperature, salinity, flow rate, discharge velocity, duration of release event, and time between release events.

The temperature of bilgewater is dependent on several factors. Bilgewater on a WPB 110 Class vessel is temporarily held in the ship's bilge or in an OWHT. Consequently, ambient air temperature inside the machinery space and the temperature of the source bilgewater can have an effect on bilgewater temperature. However, because the bilge and OWHT are separated from the waterbody only by the ship's hull, bilgewater is often at or near the ambient water temperature. Because bilgewater is not used as a cooling or heating fluid and there is ample opportunity for thermal equilibration (heat transfer through the metal hull), bilgewater is assumed to be at the temperature of the receiving water. Furthermore, for modeling purposes, the ambient water temperature is assumed to be 25º C.

Unlike other parameters used for modeling purposes, sampling data from LSD 47 and LSD 51 OWS influent was used to determine the salinity value for WPB 110 baseline discharge. To facilitate obtaining a representative salinity value, an average of the sample results were used to determine one representative salinity value for the baseline discharge (the same value is used for subsequent analysis of the primary treatment MPCD; see Section 10.2.1.1).

Of the remaining discharge characteristics required for modeling, flow, velocity, and duration of release event are interdependent. The exit velocity of the discharge port is equal to flow rate divided by the cross-sectional area of the discharge pipe (velocity = flow/area). The flow rate for the baseline is the rated capacity of the MPCD (i.e., 2 gpm for the gravity coalescer). The area is calculated from the diameter of the discharge pipe. The duration of the release event is based on the size of the OWHT, the rated capacity of any control in place, and the bilgewater generation rate. It is assumed processing begins when the OWHT reaches 70 percent (USCG, 2002) capacity. The duration is calculated as follows:

Duration of Release = (0.70 * OWHT Volume) / (Rated MPCD Capacity – Bilgewater Generation Rate)

The time between release events is determined using bilgewater generation rate data and OWHT capacities. Again, for purposes of modeling, it is assumed that the entire discharge release/non-release cycle (a release event followed by the time between release events) occurs while the vessel is pierside. The formulas used to determine some of the values in the physical parameters section are presented in Appendix A.

10.1.1.2 Constituent Data, Classical Data, and Other Descriptors

Chemical Data

During UNDS Phase II, sampling was conducted aboard two vessels of the LSD 41 Class, USS OAK HILL (November 16-17, 1999) and USS RUSHMORE (26 September 2000, 17 October 2000, 17 November 2000 and 13 December 2000). These two sampling episodes serve as surrogate chemical data for bilgewater characterization of the WPB 110 vessel group.

The samples were analyzed by Ecology and Environment, Inc., Pacific Analytical, Inc., Columbia Analytical Services (through Pacific Analytical, Inc.) and Q Biochem (formally ETS Analytical Services, Inc.). The results were reviewed by the Environmental Protection Agency (EPA) and the Department of Defense (DoD) to determine the quality of the analytical data; however, some sample data were excluded in the final calculations, as documented in the *Draft Sampling Episode Report – USS RUSHMORE* (Navy, 2001e) and *Draft Sampling Episode Report – USS OAK HILL* (Navy, 2000f), based upon Sample Control Center (SCC) review. Data quality was considered for all analyses conducted. To ensure data quality after reviewing documented matrix spike failures and process information discrepancies, a confirmation analysis was conducted for pesticides. This confirmation analysis revealed that there were no pesticides present in the reanalyzed samples. As a result, pesticides are not included in bilgewater discharge profiles (Navy and EPA, 2002).

SCC-validated data include the constituents present in the waste stream and their concentrations. Sampling was conducted on the OWS influent, which was considered the untreated baseline for this vessel group. Several methods used for analyses during Phase I are different from those used for Phase II analyses. For example, mercury was analyzed by EPA Method 1631 for Phase I, but for Phase II samples, EPA Method 1620 was used. The primary difference between these methods is that Method 1631 has a much lower detection limit than Method 1620. The decision to use Method 1620 in place of Method 1631 was due to the susceptibility of Method 1631 to a variety of interferences stemming from machinery room equipment. After reviewing Phase I analytical data, EPA Method 1620, with the higher detection level, was found to be suitable for Phase II because constituents were found in sufficiently high concentrations such that the cost of using more sensitive and expensive techniques was unjustified. The sampling and analytical decisions made for samples collected on LSD 47 are detailed in the Sampling and Analysis Plan (SAP). Four field samples were taken during each sampling episode from the influent (representing the baseline) to the OWS. For more information, see the *Sampling Episode Report – USS RUSHMORE* (Navy, 2001e and *Sampling Episode Report – USS OAK HILL* (Navy, 2000f).

Constituent concentrations are represented by the geometric mean of the measured concentrations in the influent samples. See Appendix I for final constituent values.

Field Information

Field information refers to data obtained at the time of sample collection. Due to similarities in machinery, propulsion systems, and ancillary equipment, the LSD 41 vessel group discharge information is used to represent the WPB 110 vessel group. Consequently, the LSD 41 field data presented in Table 10-2 are surrogate values for the WPB 110 vessel group.

Table 10-2. Surrogate Field Testing Parameters for WPB 110 Baseline (Based on LSD 41 Baseline Sampling Data)

Field Parameter	Values
pH	7.1
Temperature	20 ˚C
Salinity	8.0 ppt
Specific Conductance	14,000 µS/cm
Free Chlorine	0.03 mg/L
Total Chlorine	0.04 mg/L

Descriptive Information

Descriptive information refers to data collected to facilitate the environmental effects analysis. Due to similarities in machinery, propulsion systems, and ancillary equipment, the LSD 41 vessel group discharge information is used to represent the WPB 110 vessel group. Consequently, the LSD 41 vessel group data presented in Table 10-3 are surrogate data for characterization of the WPB 110 vessel group. For the parameters where the results were based on observation, the range of descriptive records provide the determinations. Specifically, color and odor determinations were made using these samples. For the parameters where the results were based on field tests, an average was used as the parameter value, except for the total dissolved gases parameter. For this parameter, the lowest dissolved oxygen (DO) value was reported in the profile report and used in the environmental effects analysis, because low DO is of greater environmental concern.

Table 10-3. Surrogate Descriptive Discharge Profile for WPB 110 Baseline (Based on LSD 41 Baseline Sampling Data)

Narrative Parameter	Field Observations
Color	Yellow, 66 Color Units
Floating Materials	Not observed in most samples collected
Foam	None observed in samples collected
Odor	Oil/ fuel smell
Scum	None observed in samples collected
Settleable Materials	None observed in samples collected
Total Dissolved Gases	DO 1.90 mg/L, no other gases were measured
Turbidity/Colloidal Matter	34 NTU/ No

10.1.1.3 Discharge Generation Rates for Mass Loading

WPB Class vessels are stationed in saltwater and freshwater ports. Daily generation rates were obtained from previously reported underway surveys (Navy, 1996 and 1997b), which assume that in -port generation rates are approximately 25 percent of the underway generation rates. The annual discharge volumes are derived in Table 10-4 by multiplying these reported values by the average number of days that the class spends in port or at sea in saltwater.

Table 10-4. Annual Generation Volumes for WPB 110 Baseline for Vessels Operating in Saltwater

Class[1]	Number of Vessels	Days In Port[2]	Days Underway (0-12 nm)	Days Underway (12+ nm)	Daily generation rate per vessel (gal/day)			Annual generation rate per class (gal/year)		
					In Port	Underway (0-12 nm)	Underway (12+ nm)	In Port	Underway (0-12 nm)	Underway (12+ nm)
AR 85	3	300	60	30	2.5E+00	1.0E+01	1.0E+01	2.3E+03	1.8E+03	9.0E+02
ASDV	2	295	60	0	1.5E+01	6.0E+01	0	8.9E+03	7.2E+03	N/A
DT 66	1	105	60	0	2.5E+00	1.0E+01	0	2.6E+02	6.0E+02	N/A
FB 65	1	275	30	0	2.5E+00	1.0E+01	0	6.9E+02	3.0E+02	N/A
IX 508	1	315	60	0	1.3E+01	5.0E+01	0	3.9E+04	3.0E+03	N/A
IX 514	1	265	315	30	1.5E+01	6.0E+01	6.0E+01	4.0E+03	1.9E+04	1.8E+03
IX 515	1	30	60	0	5.0E+00	2.0E+01	0	1.5E+02	1.2E+03	N/A
LCM 8	123	295	60	0	2.5E+00	1.0E+01	0	9.1E+04	7.4E+04	N/A
LCU 1466	2	275	40	0	1.5E+01	6.0E+01	0	8.3E+03	4.8E+03	N/A
LCU 1610	35	265	60	30	1.3E+01	5.0E+01	5.0E+01	1.2E+05	1.1E+05	5.3E+04
LT 100	1	275	60	0	1.0E+01	4.0E+01	0	2.8E+03	2.4E+03	N/A
NS 65	2	295	60	0	2.5E+00	1.0E+01	0	1.5E+03	1.2E+03	N/A
NS 68	1	295	60	0	2.5E+00	1.0E+01	0	7.4E+02	6.0E+02	N/A
NS 85	1	295	60	0	2.2E+01	1.0E+01	0	6.3E+03	6.0E+02	N/A
NS 95	1	295	60	0	5.0E+00	2.0E+01	0	1.5E+03	1.2E+03	N/A
NS 100	2	285	60	0	1.0E+01	4.0E+01	0	5.7E+03	4.8E+03	N/A
PB 65	2	115	200	0	2.5E+00	1.0E+01	0	5.8E+02	4.0E+03	N/A
PC 1	13	95	6	254	3.0E+01	1.2E+02	1.2E+02	3.7E+04	9.4E+03	4.0E+05
PE 70	6	215	100	0	2.5E+00	1.0E+01	0	3.2E+03	6.0E+03	N/A
SC 65	5	285	60	0	1.0E+01	2.5E+01	0	1.4E+04	7.5E+03	N/A
SLWT 80	21	295	60	0	2.5E+00	1.0E+01	0	1.5E+04	1.3E+04	N/A
SLWT 84	7	295	60	0	2.5E+00	1.0E+01	0	5.2E+03	4.2E+03	N/A
SOC 82	20	270	60	45	5.0E+00	2.0E+01	2.0E+01	2.7E+04	2.4E+04	1.8E+04
TR 65	3	295	30	45	2.5E+00	1.0E+01	1.0E+01	2.2E+03	9.0E+02	1.4E+03
TR 72	4	295	5	45	2.5E+00	1.0E+01	1.0E+01	3.0E+03	2.0E+02	1.8E+03
TR 85	5	295	5	45	2.5E+00	1.0E+01	1.0E+01	3.7E+03	2.5E+02	2.3E+03
TR 100	3	305	5	45	1.0E+01	4.0E+01	4.0E+01	9.2E+03	6.0E+02	5.5E+04
TR 120	6	305	5	45	1.0E+01	4.0E+01	4.0E+01	1.8E+04	1.2E+03	1.1E+04
UB 82	1	195	150	0	2.5E+00	1.0E+01	0	4.9E+02	1.5E+03	N/A
UB 165	3	225	150	0	1.5E+01	6.0E+01	0	1.0E+04	2.7E+04	N/A
WB 74	11	195	150	0	2.5E+00	1.0E+01	0	5.4E+03	1.7E+04	N/A
WB 110	1	195	150	0	2.5E+00	1.0E+01	0	4.9E+02	1.5E+03	N/A
WLI 65	3	146	205	0	2.5E+00	1.0E+01	0	1.1E+03	6.2E+03	N/A
WPB 82	2	297	30	28	2.5E+00	1.0E+01	1.0E+01	1.5E+03	6.0E+02	5.6E+02
WPB 87	51	114	200	36	5.0E+00	2.0E+01	2.0E+01	2.9E+04	2.0E+05	3.7E+04
WPB 110	49	127	200	28	4.0E+00	2.5E+01	2.5E+01	2.5E+04	2.5E+05	3.4E+04
WYTL 65	12	38	300	13	1.5E+01	6.0E+01	6.0E+01	6.8E+03	2.2E+05	9.4E+03
YDT 17	2	295	60	0	1.5E+01	6.0E+01	0	8.9E+03	7.2E+03	N/A

Class[1]	Number of Vessels	Days In Port[2]	Days Underway (0-12 nm)	Days Underway (12+ nm)	Daily generation rate per vessel (gal/day)			Annual generation rate per class (gal/year)		
					In Port	Underway (0-12 nm)	Underway (12+ nm)	In Port	Underway (0-12 nm)	Underway (12+ nm)
YFU 91	1	155	200	0	1.5E+01	6.0E+01	0	2.3E+03	1.2E+04	N/A
YP 654	2	195	150	0	2.5E+00	1.0E+01	0	9.8E+02	3.0E+03	N/A
YP 676	21	205	150	0	1.0E+01	4.0E+01	0	4.3E+04	1.3E+05	N/A
YSD 11	1	295	60	0	1.3E+01	5.0E+01	0	3.7E+03	3.0E+03	N/A
YTB 760	19	285	60	0	7.5E+00	3.0E+01	0	4.1E+04	3.4E+04	N/A
YTL 422	1	295	60	0	2.5E+00	1.0E+01	0	7.4E+02	6.0E+02	N/A
WLM 133	1	149	150	36	2.0E+01	8.0E+01	8.0E+01	3.0E+03	1.2E+04	2.9E+03
WLIC 100	1	146	205	0	1.0E+01	4.0E+01	0	1.5E+03	8.2E+03	N/A
WLIC 75	8	146	205	0	7.5E+00	3.0E+01	0	8.8E+03	4.9E+04	N/A
Total	463	-	-	-	3.8E+02	1.4E+03	5.7E+02	5.9E+05	1.3E+06	5.7E+05

[1] Annual generation rates are not calculated for vessels located in foreign ports.
[2] Total Number of days for in port, Underway 0-12nm, and Underway 12+nm may not add up to 365 days due to some vessel classes being removed from the water to facilitate cleaning, maintenance, and/or repair.

Similar to the values calculated for vessels stationed in saltwater, the annual discharge volumes for vessels stationed in freshwater are calculated in Table 10-5 by multiplying these reported values by the average number of days that the class spends in port or in freshwater.

Table 10-5. Annual Generation Volumes for WPB 110 Baseline for Vessels Operating in Freshwater

Class	Number of Vessels	Days In Port[1]	Days Underway (0-12 nm)	Daily generation rate per vessel (gal/day)		Annual generation rate per class (gal/year)	
				In Port	Underway (0-12 nm)	In Port	Underway (0-12 nm)
LCM 8	6	295	60	2.5E+00	1.0E+01	4.4E+03	3.6E+03
LCU 1610	1	265	40	1.3E+01	5.0E+01	3.3E+03	2.0E+03
NS 111	1	285	60	1.3E+01	5.0E+01	3.7E+03	3.0E+03
WLI 100	1	146	205	1.0E+01	4.0E+01	1.5E+03	8.2E+03
WLIC 75	1	146	205	7.5E+00	3.0E+01	1.1E+03	6.2E+03
WLIC 100	1	146	205	1.5E+02	2.1E+02	2.2E+04	4.2E+04
WLR 65	6	140	205	7.5E+00	3.0E+01	6.3E+03	3.7E+04
WLR 75	11	140	205	7.5E+00	3.0E+01	1.2E+04	6.8E+04
Total	28	-	-	2.1E+02	4.5E+02	5.3E+04	1.7E+05

[1] Total Number of days for in port, Underway 0-12nm, and Underway 12+nm may not add up to 365 days due to some vessel classes being removed from the water to facilitate cleaning, maintenance, and/or repair.

10.2 PRIMARY TREATMENT

Gravity coalescer represents the currently installed primary treatment MPCD onboard WPB 110 Class vessels. Most ships of the WPB 110 Class currently have one 2-gpm system with a single discharge location. As a result, subsequent analyses are based on a single 2-gpm system processing the entire volume of bilgewater. Primary treatment creates two waste streams: the aqueous fraction, which is discharged overboard, and the oil fraction, which is directed to the onboard waste oil holding tank. The characterization of the aqueous fraction is described below.

The oil fraction is subject to collection, holding and transfer (CHT), treatment at a properly permitted facility, and applicable Federal, State, and local disposal regulations.

10.2.1 Characterization Data

Characterization data are comprised of physical parameters, chemical data, field data, and descriptive information. Each of these is discussed below. See Section 10.1.1 for identification of possible bilgewater sources.

10.2.1.1 Physical Parameters

The physical parameters include values necessary for hydrodynamic modeling of the discharge, as detailed in Section 10.1.1.1, are not affected by the addition of a primary treatment MPCD. Table 10-6 summarizes the parameters used for modeling.

Table 10-6. Discharge Characteristics for WPB 110 Primary Treatment

Modeling Parameters	Values
Option Group	Primary Treatment
Vertical (feet)	+1
Transverse (feet)	+10
Length (feet)	74
Diameter (inches)	0.5
Temperature (°C)	25
Salinity (ppt)	8.0
Flow (gpm)	2
Velocity (ft/sec)	3.3
Duration of Release Event (hr)	0.90
Time Between Release Events (hr)	648

Vertical – Approximate distance from waterline to discharge port (+, above, -, below)
Transverse – Distance from centerline to discharge port (+, port, -, starboard)
Length – Approximate distance from forward perpendicular to discharge port
Diameter – Diameter of discharge port
ppt – parts per thousand
gpm – gallons per minute
ft/sec – feet per second
hr – hour
°C – Degree Celsius

The formulas used to determine some of the values in the physical parameters section are presented in Appendix A.

10.2.1.2 Constituent Data, Classical Data, and Other Descriptors

Chemical Data

Sampling was conducted on one LSD 41 Class vessel, USS RUSHMORE (LSD 47), and serves as the surrogate chemical data for this vessel group. The samples from this ship were taken prior to and following the gravity coalescer. Constituent concentrations are represented as the geometric mean of the measured concentrations in the effluent samples. Some analytical data were excluded, as documented in the Sampling Episode Report (SER), based upon SCC review of the data. See Appendix H for final constituent values.

Field Information

Field information refers to data obtained at the time of sample collection. Due to similarities in machinery, propulsion systems, and ancillary equipment, the LSD 41 vessel group discharge information is used to represent the WPB 110 vessel group. Consequently, the LSD 41 field data presented in Table 10-7 are surrogate values for the WPB 110 vessel group.

Table 10-7. Surrogate Field Testing for WPB 110 Primary Treatment (Based on LSD 41 Primary Treatment Sampling Data)

Field Parameter	Values
pH	6.9
Temperature	16.1 °C
Salinity	7.4 ppt
Specific Conductance	13,000 µS/cm
Free Chlorine	0.04 mg/L
Total Chlorine	0.04 mg/L

Descriptive Information

Descriptive information refers to data collected to facilitate the environmental effects analysis. Due to similarities in machinery, propulsion systems, and ancillary equipment, the LSD 41 vessel group discharge information is used to represent the WPB 110 vessel group. Consequently, the LSD 41 vessel group data presented in Table 10-8 are surrogate data for characterization of the WPB 110 vessel group. For the parameters where the results were based on observation, the range of descriptive records provide the determinations. Specifically, color and odor determinations were made using these samples. For the parameters where the results were based on field tests, an average was used as the parameter value, except for the total dissolved gases parameter. For this parameter, the lowest DO value was reported in the profile report and used in the environmental effects analysis, because low DO is of greater environmental concern.

Table 10-8. Surrogate Descriptive Discharge Profile for WPB 110 Primary Treatment (Based on LSD 41 Primary Treatment Sampling Data)

Narrative Parameter	Field Observations
Color	Variable: ½ clear and ½ yellow
Floating Materials	None observed in most samples collected
Foam	None observed in samples collected
Odor	Oil/Fuel smell
Scum	None observed in samples collected

Settleable Materials	None observed in samples collected
Total Dissolved Gases	DO 0.40 mg/L, no other gases were measured
Turbidity/Colloidal Matter	33 NTU/No

10.2.1.3 Discharge Generation Rates for Mass Loading

The use of a primary treatment MPCD does not affect the generation rate of bilgewater; therefore, the baseline generation and annual volume data are used for the annual discharge volume for this MPCD treatment system. It is assumed that the volume change due to the removal of oil by the treatment device is negligible. See Table 10-4 and Table 10-5, Section 10.1.1.3, for the baseline generation volumes.

10.3 COLLECTION, HOLDING, AND TRANSFER WITHIN 12NM

CHT is the onboard collection, containment, and subsequent transfer of bilgewater to shore facilities or ship waste offload barges. CHT does not involve any treatment of raw bilgewater on board the generating vessel. CHT may require the installation of some shipboard equipment, such as piping or tanks, to provide additional holding capacity. This MPCD option results in no (zero) liquid discharge to surrounding waters within 12 nm.

10.3.1 Characterization Data

Characterization data are comprised of physical parameters, chemical data, field data, and descriptive information. Each of these parameters is discussed below. See Section 10.1.1 for identification of bilgewater sources. However, because this MPCD option results in no (zero) liquid discharge to surrounding waters within 12 nm, there are no characterization data to address.

10.3.1.1 Physical Parameters

This MPCD option results in no (zero) liquid discharge to surrounding waters within 12 nm; therefore, there are no discharge characteristics to consider.

10.3.1.2 Constituent Data, Classical Data, and Other Descriptors

Chemical Data

Because a waste stream is not directly discharged to surrounding waters within 12 nm for this MPCD option, there are no constituents to consider.

Field Information

Because a waste stream is not directly discharged to surrounding waters within 12 nm for this MPCD option, there are no field data to consider.

Descriptive Information

Because a waste stream is not directly discharged to surrounding waters within 12 nm for this MPCD option, there is no descriptive information to consider.

10.3.1.3 Discharge Generation Rates for Mass Loading

CHT results in no (zero) direct liquid discharge to surrounding waters within 12 nm. Therefore, the annual discharge volume is zero.

10.4 UNCERTAINTY AND DATA QUALITY FOR WPB 110 DISCHARGE

The sources and levels of uncertainty in bilgewater characterization data vary by discharge parameter. This subsection describes the uncertainty associated with physical parameters; constituent data, classical data, and other descriptors; and discharge generation rates.

10.4.1 Physical Parameters Uncertainty and Data Quality for WPB 110 Discharge

Schematic Data

The information provided for the physical parameters of WPB 110 discharge is based on process knowledge and the vessel specifications of the representative vessel. Certain physical parameter values used in this report, including representative vessel length, discharge port diameter, and distance from centerline to discharge port (transverse), are taken directly from vessel schematics. These parametric values do not vary among vessels in the class. Certain other parameters vary with load conditions. These condition-specific parameters include: approximate distance from waterline to discharge port (vertical) and discharge method. The discharge was assumed to occur under full load conditions to facilitate a comparison of baseline and MPCD option performance. This assumption is supported by Armed Forces expert knowledge of ship status, which indicated that when vessels are pierside they typically are loaded for deployment.

Modeling Data

One use of the discharge characterization information is to provide input data for hydrodynamic modeling of a discharge plume within a mixing zone. Modeling is performed to determine plume dilution factors at the edge of a mixing zone. Modeling calculations involve various parameters that include discharge temperature, salinity, and vessel attributes related to bilgewater discharge, such as the distance from the discharge port to the waterline. The bilgewater temperature was assumed to be equal to ambient water temperature for modeling purposes. Bilgewater is stored in OWHTs in direct contact with the hull, resulting in temperature equilibration. The bilgewater data for salinity was taken from UNDS sampling data. Uncertainty related to sampling is discussed in Section 10.4.2 and applies to the salinity data.

As stated in Section 10.1.1.1, the discharge flow rate used to characterize the discharge is based on the rated capacity of the processor as reported by the manufacturer. The duration of, and time between release events are closely related and are dependent on the volume of the OWHT. The volume of the OWHT at processing onset determines the duration of the release event.

Likewise, the time between release events is related to the capacity of the OWHT and the bilgewater generation rate. A simplifying assumption, that the release of bilgewater discharge occurs when the OWHT reaches 70 percent of capacity, was made based on knowledge derived from Coast Guard equipment experts.

10.4.2 Constituent Data, Classical Data, and Other Descriptors Uncertainty and Data Quality for WPB 110 Discharge

The primary uncertainty associated with the WPB 110 vessel group data is due to the lack of sampling data from the representative vessel or any other vessel within the vessel group. Sample data used to characterize this vessel group were taken from UNDS Phase II sampling results for the LSD 41 vessel class. Because the LSD 41 data is presented as surrogate data for the WPB 110 vessel group the uncertainty associated with the LSD 41 data is discussed here. The LSD 41 was used to represent the WPB 110 vessel group because the engine types and ancillary equipment for the WPB 110 and LSD 41 classes are similar. The use of LSD 41 data for the WPB 110 is expected to provide a conservative illustration of the discharge. Sampling was conducted aboard the LSD 47 and LSD 51 according to the SAP (Navy, 2000f and 2001e). Deviations in sampling practices, analytic testing, laboratory equipment, processing equipment, and specimen handling exist and may affect the results. For more information on the sampling plan, see the LSD 47 and LSD 51 SAPs.

During the sampling episode, deviations from the sampling plan were noted in the SER.

- Sampling deviations recorded on USS RUSHMORE (LSD 47) were due to the inability to sample while the ship was underway. All samples were collected while the vessel was in port. Consequently, the ceramic membrane permeate was directed to the waste oil tank (WOT) instead of being discharged overboard.
- Deviations from the SAP on USS OAK HILL (LSD 51) included the possible inadvertent discharge of oily waste overboard due to a malfunctioning oil content monitor.

The SER also details issues identified during the sample analysis, including the SCC’s review of the analytical data. The reports also contain further details regarding any additional data qualifiers for specific constituents for the samples. A complete description of how qualified data were used in the UNDS program can be found in Section 10.1.1.2.

10.4.3 Discharge Generation and Data Quality Uncertainty for WPB 110 Discharge

Bilgewater generation rates for the WPB 110 vessel group used in this report to characterize the discharge are estimates based on process knowledge and previously reported values. The UNDS Phase I Surface Vessel Bilgewater/OWS Nature of Discharge Report (NOD) estimates that the average in-port generation rate for a WPB Class Vessel is approximately 2000 gal/day (EPA and DoD, 1999). However based on performance data, the size of the vessel, machinery (i.e. propulsion engine and shafts), and age of the vessel, the generation rate is only 4 gal/day in port and 25 gal/day underway. The NOD estimate was the average of a wide selection of vessel groups, not the WPB in particular; hence, the estimate was not used. Additionally, the 47 ship classes that comprise this vessel group vary in vessel size, machinery, and displacement. Vessel engine and auxiliary machinery rooms are the main sources of bilgewater (EPA and DoD, 1999) therefore unlike other discharges, the bilgewater generation rates do not depend on crew size. As a result, having multiple vessel classes in the group with a wide range of sizes and propulsion plant characteristics results in variation in generation rates and adds uncertainty to these values.